HDTV 45 Mbps Video Coder/Decoder

CLI COMPRESSION LABS, INCORPORATED

Advance Information

The Compression Labs HDTV 45 Mbps Video Coder/Decoder is the first high definition television product for transmitting broadcast quality video at bit rates from 45 to 140 Mbps. These low bit rates permit economical digital transmission of high definition video over the ever-expanding network of DS-3 lines, as well as 27 and 54 MHz satellite channels. Future support of B-ISDN will be available. Proprietary CLI compression technology enables reduction of the enormous amount of raw data in HDTV to a rate compatible with economical transmission media.

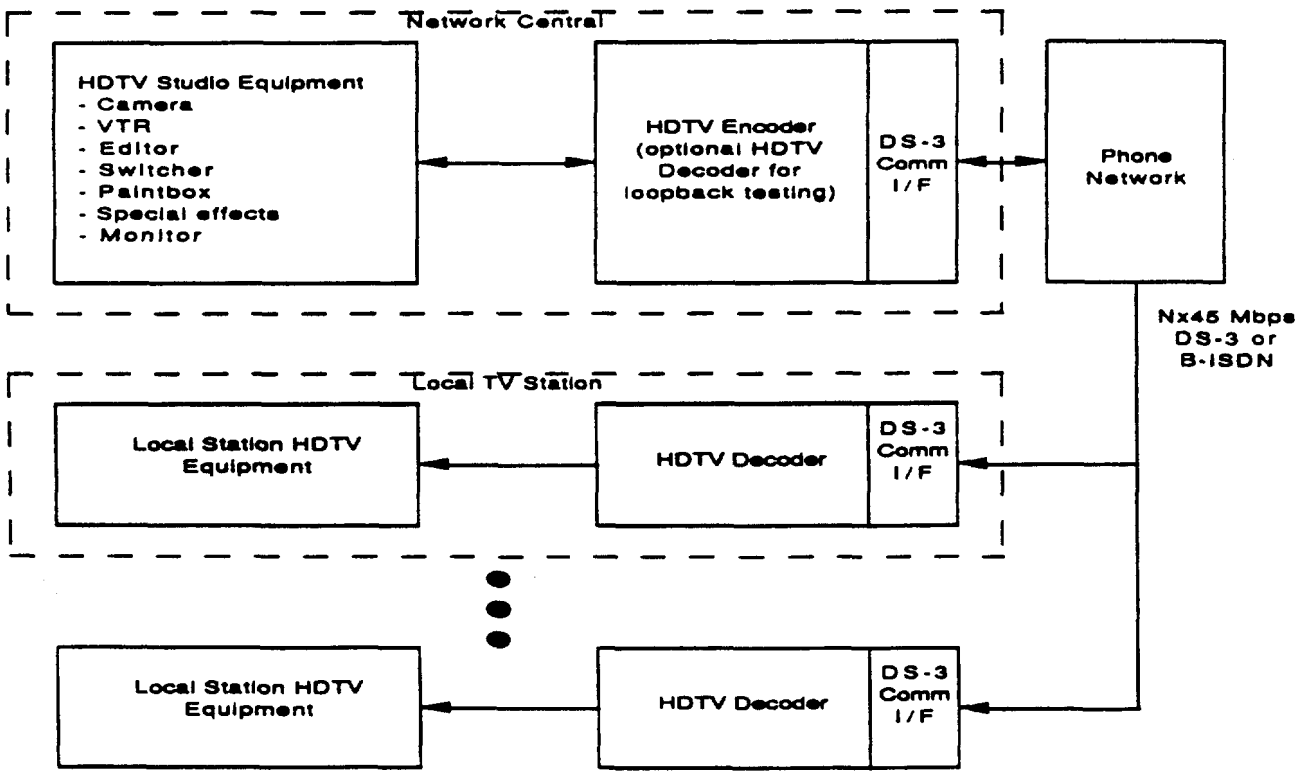
HDTV Coder/Decoder Applications

- Broadcast video distribution
- Videoconferencing
- Education & training
- Motion picture distribution
- Television advertising distribution
- Medical remote diagnosis
- Military & intelligence

HDTV Coder/Decoder Features

- Digital video compression permits HDTV transmission over terrestrial phone lines
- Compression lowers transmission costs
- Lowered bit rates & digital format allow transmission channel selection flexibility
- Broadcast quality video
- Robust, high-quality, noise-free transmission over digital channels
- Four channels of CD-quality audio
- Adheres to SMPTE 240M, with flexibility to migrate to evolutions of this and to meet other production standards that may arise in Europe and Japan
- Flexibile, modular architecture allows serving a variety of bit rates and applications, and provides customers an upgrade path
- Digital encryption for security
- Send-only & receive-only configurations available for point-to-multipoint applications
- Built-in diagnostics
- Coder & decoder can be slaved to form codec

HDTV Coder/Decoder Point-to-Multipoint Distribution Application



Specifications

Video

Interface	SMPTE 240/M,1125/30 Y=30 MHz, P_R, P_B=15 MHz Tri-level Sync
Interlace	2:1
Vertical Resolution	1035
Horizontal Resolution	1920
Aspect Ratio	16:9
Signal-to-Noise Ratio	>50 dB
Compression	DCT with motion compensation using proprietary CLI technology

Audio

Interface	Digital audio 800 Kbps/chan uncompressed
Number of Channels	4
Compression	4:1, <200 Kbps/chan

User Interface

Front Panel Control & Serial Interface

- Select bit rate (channel select)
- Select audio channel configuration
- Select Maintenance

Transmission

Digital Channel	DS-3 & multiples + B-IDSN (45, 90, 140 Mbps)
Forward Error Correction	Sufficient for fiber optic error rate objectives
Encryption (option)	DES

Environmental

Operating Temperature	10° to 40° C
Humidity	15% to 95%
Heat Dissipation	BTUs/hour typical

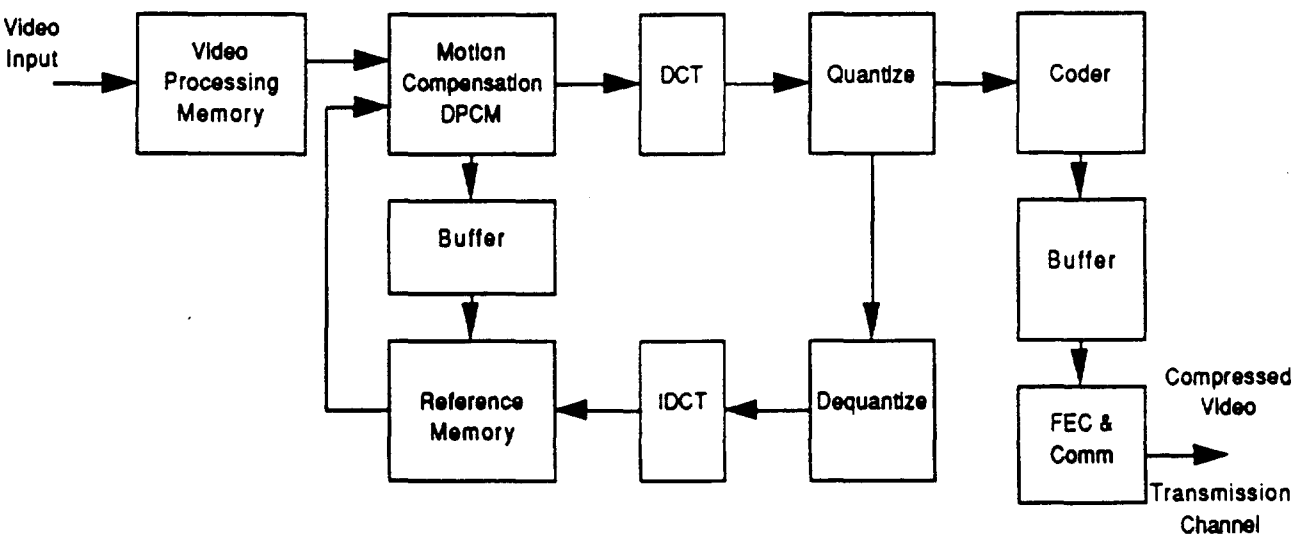
Mechanical

19" rack-mountable
Separate coder& decoder

Power Requirements

USA	90-132 VAC, 47-63 Hz
International	180-264 VAC, 47-63 Hz
Optional Telco Power	-48 to -56 volts

HDTV 45 Mbps Video Coder/Decoder Block Diagram



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FOURTH INTERIM REPORT OF THE WORKING PARTY 5 ON ECONOMIC FACTORS AND MARKET PENETRATION

of the

PLANNING SUBCOMMITTEE

of the

ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

March 4, 1991

TABLE OF CONTENTS

EXECUTIVE SUMMARY

During the fourth period of work, WP-5 continued studies leading to a revised projection of the rate of penetration of ATV receivers in the US market. This projection was based on new assumptions on the price elasticity of an ATV receiver; the possibility that Europe and Japan may begin large-scale production of ATV receivers before the US; and on an initially limited availability of ATV programming. A range of scenarios was considered, driven by a range of underlying assumptions.

Subsequent to the development of this second penetration scenario, and in concert with the work of SS WP-3, further considerations were taken into account. These included the economic impact of new technology applied to ATV signal transmission, and the feasibility of providing at the inauguration of ATV service a full schedule of broadcast service.

These considerations, taken together, suggested that the upper bound of the the second penetration scenarios may indeed be realized, or even possibly exceeded. It is therefore the view of the Chairman of WP5, and certain other members, that, after an initial one percent penetration of the market has been achieved perhaps by the alternative ATV distribution media, a ten percent market penetration could be achieved in five years and 40 percent in ten years. However, this view has not been reviewed by the full Working Party subsequent to its consideration of the various recent working documents on new technology and expected availability of programming.

1. INTRODUCTION AND BACKGROUND

Following the development of an initial projection of potential penetration of ATV receivers in the market place by the Working Party on Economic Factors and Market Penetration (WP5) it became clear at the beginning of the work period just completed that some of the underlying assumptions were very conservative, and should be reviewed in the light of new technology being developed for the terrestrial transmission of ATV signals. The initial penetration scenario was considered highly conservative by some (but not all) members of WP5 and informed outside observers. It was more pessimistic than most (but not all) projections published previously. During the second and third Advisory Committee work periods, additional information on technology and several economic issues, including price elasticities of demand, became available.

During the fourth work period, therefore, WP5 reviewed the new information and revisited the key assumptions underlying its projections of market penetrations, and a second set of penetration scenarios was developed, working in collaboration with SS WP-3.

Subsequently, additional perspectives were gained, which suggested that even the second set of penetration scenarios may still be somewhat conservative.

This report briefly revisits the second set of scenarios for market penetration, and discusses the possible impact of the most recent perspectives on the assumptions used to develop the second set of penetration scenarios. It also presents a preliminary discussion of what impact these new considerations may have on the overall projected level of market penetration. It should be noted, however, that while this discussion reflects the views of the Chairman of WP5 and certain other WP5 members, it has not yet been reviewed or approved by the Working Party as a whole.

2. WORK STATEMENT FOR THE FOURTH PERIOD

WP-5 was required to perform the following work:

Estimate costs to convert present NTSC stations to ATV simulcast operation, basing equipment costs on a competitive market place

Develop a family of market penetration projections in conjunction with SS WP-3

Investigate the implications of ATV policies for industrial development and international trade.

During the work period, most of the effort has been directed to the first two requirements, and the results obtained are presented below.

3. THE SECOND SET OF MARKET PROJECTIONS

The second set of penetration scenarios were developed based on the considerations of new information or estimates in the following five areas:

Price elasticity

Projected ATV program availability

Estimated rates of cost reduction based on consideration of potential by global economies of scale and manufacturing experience

A review of the validity of the historical models used as a guide to market penetration

New assessments of the likely impact of new and developing technology on the prior assumptions

3.1 Price Elasticity

Price elasticity was studied by Ken Dunmore of Economists Incorporated. In his report (Document NO. PS WP-5-0041), it was concluded that the demand for television receivers is very price elastic, and that long run price elasticities of demand for color TV sets average -1.3. Large screen sets, however, were found to have a price elasticity of about -0.7 in one study.

The demand for TV receivers becomes more price-elastic over time. For large screen sets of introduction, the elasticity is near zero.

In a subsequent study by Booz, Allen and Hamilton, it was decided to use a price elasticity of -1.75, for development of the second penetration scenario.

3.2 Historical Models

WP5, with written inputs from several participating individuals and organizations (see section 6) reviewed a wide range of possibilities for historical analogies with market-penetration experience with other innovations in consumer electronics and/or entertainment.

Superficially, the VCR would appear to be a useful historical model for the development of ATV penetration rates, but certain limitations are evident. Firstly, the VCR, in its initial consumer application of time-shifting broadcast television programs, did not provide a service of new or different programs, and it did not enhance the technical quality of the display. Rather, it simply addressed the needs of the consumer for a time shifting mechanism for his TV viewing convenience.

For the first three years after the introduction of the VCR, there was a lack of non-broadcast programming available for home viewing on cassettes, either for sale or for rental. Only when a wide range of programming became available for rental at low cost, did VCR penetration of the market increase rapidly. This fact alone constrains the use of the early adoption rate of the VCR as a guide to the likely penetration rate of ATV receivers.

The use of color TV as a historical model has the merit of an intuitive similarity to ATV adoption, and a high introductory consumer cost comparable -- in constant dollars -- to possible ATV receiver prices, but suffers from one serious limitation.

As shown graphically in Figure 1, as the consumer cost of a color TV set fell dramatically in the first years of introduction, market penetration made virtually no gains. Only in 1966, when all three networks first provided a full schedule of primetime programming in color, did penetration begin to advance rapidly.

COLOR TV SET PENETRATION COMPARED WITH COST OF A COLOR TV SET

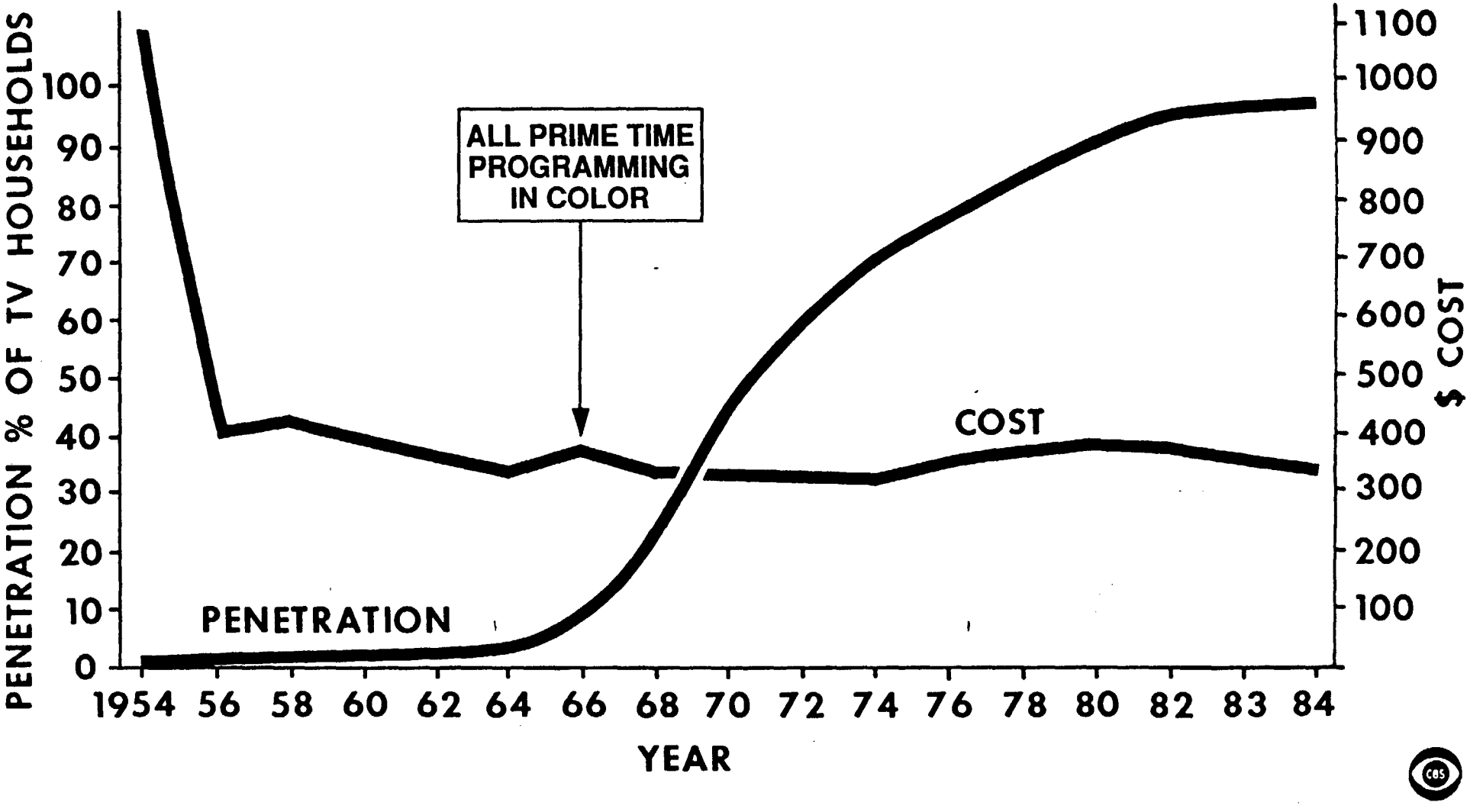

FIGURE 1

If in fact ATV service can start with a full schedule of ATV programming on the simulcast channel (see discussion in section 4 below), it is arguable that the early program-hungry years of color TV should be discounted in using color TV as a historical model.

However, at the time of color's rapid penetration of the market, the consumer price of a color set was much less than present expectations of the price of an ATV set at its market introduction.

Finally, it should be noted that no valid studies exist which compare the consumer's perceived value of a color TV set with that of an ATV receiver.

From these considerations, it may be concluded that if the color TV or VCR be used as a model for penetration, allowance must be made for the lack of available programming in the first years of introduction until a one percent penetration rate was achieved.

3.3 Penetration Scenarios: the Second Set of Market Penetrations

This scenario was developed largely by the staff of Booz, Allen and Hamilton, and subsequently adopted by WP5 as an acceptable broad indication of possible future market trends, rather than a firm forecast. Its development was influenced primarily by the following considerations:

- The new price elasticity estimates and new estimates of the ATV receiver costs at market introduction

- The possibility that Europe and Japan might begin large scale ATV receiver production alongside, or before, the United States. Booz, Allen's prior model of potential cost and price reductions for ATV receivers was based on consideration of the US market alone. This model was revised, using the working assumption that production in Europe and Japan would begin in 1993, and that US-based production would begin in 1996. If this occurs, it will result in somewhat lower ATV receiver costs when the US enters the market, through the earlier achievement of economies of scale and manufacturing design efficiencies and experience

- A judgement that the inherent attractiveness of ATV to the consumer will be greater than presumed in the prior estimates, based in part on considerations put forward by Larry Thorpe of SS WP-3 concerning opportunities for optimizing programming formats to make full use of the capabilities of ATV

The second penetration scenario, however, retained the following assumptions underlying the first scenario, namely:

- The ATV signal would be downward compatible with NTSC

- Three years after introduction, ATV would exist in 15 percent of TV stations, five of the largest cable TV programming networks, and in 15 percent of cable systems

- Consumer preference for ATV relative to NTSC would be less than that for color TV versus black and white TV

- The ATV receiver price in each year after introduction would be similar - in constant dollars - to the price of color TV in the same number of years after the introduction of color.

From these considerations and assumptions, three projections were developed, optimistic, pessimistic and mid-point projection. This last projection suggests that the ATV receiver penetration will be five percent five years after the introductory one percent has been achieved, and 30 percent 10 years after the one percent level of market penetration has been reached.

Following the issuing of these projections by WP5 a number of technical developments have occurred which may further impact the second penetration scenario, and these are now discussed.

4. NEW CONSIDERATIONS AND THEIR IMPLICATIONS FOR MARKET PROJECTIONS

4.1 Digital Technology

The most important technical development during the fourth work period in terms of its indirect implications for the prospect of early market penetration by ATV is that all but one of the proponent systems now propose to use an all-digital terrestrial transmission system. Inter alia, this will result in lower power and lower cost transmission equipment, and will enable TV stations to effect the transition to simulcast ATV service at a much lower cost than previously projected, as reported in the following section.

It is further expected that costs and prices for ATV receivers will be somewhat lower than the previous WP5 estimates if a digital transmission standard is selected by the FCC. This change would, however, have little or no impact on the cost of the consumer display, which remains the largest single cost component of the ATV receiver, at least for the period in which a CRT is the only practicable display device.

4.2 Transition Scenarios

In response to the work statement for WP-5, studies have been conducted on the costs of converting a TV station to provide simulcast ATV service. Earlier work by SS WP-3 had produced a projection of a capital cost for conversion of $38 million, but this did not take account of the more recent proposals for transmission technology.

During the current period, PBS developed a transition scenario for its particular operating requirements, and projected a cost of $12 million for the complete conversion of a PBS station to ATV service. This scenario is presented in Appendix B.

In response to the work requirement, a new transition scenario was developed by CBS. Its interim findings are presented in Appendix A to this report. The basic assumptions made were that:

- Stations in the largest markets will convert first
- The transition will take place in phases, and will be spread over several years
- The transmission system will require lower power than current NTSC transmission systems and will use a smaller antenna
- Each doubling of the cumulative volume of ATV equipment manufactured will lead to a 10 percent reduction in the prior cost

Based on these assumptions, it is projected that for the first 30 stations in the largest markets, serving 31 percent of the television households, the capital cost of equipment and the labor to install it would be approximately $12 million, and investment which would be spread over a five year transition period in five phases. However, in the first phase, to be completed in approximately one year, the station will be able to receive pass through, and re-transmit the ATV signal as a terrestrially broadcast service.

It is further projected that subsequent groups of stations, each twice the size of the previous group, will start the transition process in succeeding years, and would extend the period of conversion over longer periods. Thus, for stations in smaller markets, the annual capital investment required would be reduced, and the actual cost of each phase of the conversion would be reduced through the economies of scale developed, and through the refinements in equipment manufacturing design and efficiency.

It would follow that, for stations in the smaller markets starting the conversion four years later, the total cost of the transition to full ATV service will fall to less than $8 million.

4.3 Programming

Central to any penetration scenario is the availability of ATV programming, the lack of which severely constrained the penetration of both the VCR and color TV in the introductory years.

Recognizing the enormous requirements for programming to fill a full day's broadcast schedule on the ATV simulcast channel, it is clear that sufficient new ATV produced programs will not be available at the outset. Interim techniques are therefore being studied in order to fill the void.

Firstly, feature films produced on 35 mm. film, are in fact high definition, and they can be readily transferred to the HD format for broadcast. Equally, virtually all television drama and movies-of-the-week, constituting 70 percent of prime time programming are also shot on 35mm. film, and these too can be transferred to the HD broadcast format.

For the remaining programs that have been produced electronically in the current 525-line NTSC format, the NTSC signal may be "up-converted" to the HD format, and broadcast on the simulcast channel, much as synthesized stereo audio has been used in the introduction of full stereo audio television service. This option however, results in a black curtain at each side of the 4:3 aspect ratio picture.

A second option, which is appropriate when local origination is required, is to shoot studio productions with a 525-line camera adapted for a 16:9 aspect ratio lens and recorded on a 16:9 aspect ration VTR. This signal would then be broadcast on the simulcast channel, while a narrow screen down-conversion would be broadcast on the NTSC channel.

While neither of these options provides true High Definition, subjectively they will be superior to NTSC, and will serve as an interim measure during the introductory period of HD penetration. By such means a full broadcast schedule can be provided on the simulcast channel from the outset, and potentially improve the rate of consumer acceptance and market penetration.

4.4 Conclusions

Based upon the economic impact of new digital transmission technology, and upon the feasibility of providing a full broadcast schedule on the ATV simulcast channel, it is the Chairman's view that the second penetration scenario's upper and more optimistic bound now has greater validity. This upper bound projects a 10 percent penetration in five years, and a 40 percent penetration in 10 years, both of these time periods counted from the starting points provided by the achievement of one percent penetration.

This initial one percent penetration point could well be reached much earlier than was the case with color TV, because improved quality programming can be made available

at the introduction of ATV service. Moreover, it remains likely that ATV home video players and ATV cable service will in fact precede the introduction of ATV terrestrial broadcasting, and even seed the market to the one percent penetration point before the ATV terrestrial service is inaugurated.

5. FUTURE WORK

It is proposed that WP-5, having completed its present contribution on market penetration, given the present status of technological development, should next investigate the implications of ATV policies for industrial development and international trade.

One long-awaited element - the availability of a large wall mounted display using plasma or solid state technology - could have a dramatic effect on market penetration, because it affords the optimum size of display for the home viewer, and is likely to be significantly less expensive than previous technology for the large display formats needed to realize the full consumer benefits of ATV.

Secondly, if the Multiport scheme proposed by PS WP-4 is successfully developed, the confluence at the receiver display of ATV and NTSC programs delivered by terrestrial transmission, satellite broadcast cable, and home video, could lead to further cost savings and/or capability enhancements in the consumer-based equipment. This development could lead in turn to a greater rate of market penetration.

6. DOCUMENTS

PS WP-5-0041	ATV issues raised at the joint meeting of PS-WP-5 and SS WP-3 on 10.30.89. Ken Dunmore, Economists Incorporated. 2.90.
PS WP-5-0042	Minutes of PS WP-5 meeting. 2.22.90
PS WP-5-0043	Development of revised projections of market penetration for ATV. Booz, Allen and Hamilton, 3.14.90
PS WP-5-0044	Review/updating of ATV costs, prices and market penetration (second scenario), Booz, Allen, and Hamilton, 8.16.90
PS WP-5-0045	Television system evaluation and consumer electronics products, D. Joseph Donahue, Thomson Consumer Electronics. 8.23.90

PS WP-5-0046	Further considerations on the projection of penetration rate of HDTV consumer equipment, Rupert Stow Associates, 1.17.91
PS WP-5-0047	HDTV Transition Scenario for TV stations - a CBS work in progress. 2.20.91
PS WP-5-0048	PBS Study on HDTV Transition Costs. 10.20.90

7. MEETINGS

Two meetings were held jointly with SS WP-3 on 3.14.90 and 8.23.90, during the fourth period of work.

APPENDIX A

HIGH DEFINITION TELEVISION

TRANSITION SCENARIO FOR TV STATIONS

A CBS WORK-IN PROGRESS

February 20, 1991

Preliminary Results

TABLE OF CONTENTS

APPENDICES

HIGH DEFINITION TELEVISION

TRANSITION SCENARIO FOR TV STATIONS

A CBS WORK-IN-PROGRESS

1. INTRODUCTION

High Definition Television is a major technical advance over the present NTSC broadcast system. Having twice the resolution, improved color rendition, a wide screen aspect ratio, and digital stereo sound, HDTV may prove to be the medium of choice for the home viewing by the turn of the century.

No regulatory or technical barriers hinder the introduction of wide-band high definition service to the home through the distribution media of home video, cable, or direct broadcast by satellite.

Terrestrial broadcasting, however, in attempting to compete with these new high quality services, faces a special challenge. High definition television intrinsically requires a greater transfer of information than can be obtained within the 6 MHz currently allowed for by NTSC television. The radio frequency spectrum is crowded, and the limited spectrum available precludes an unlimited allocation for the use of a new wide bandwidth terrestrial transmission system.

Past Chairman of the FCC, Dennis Patrick, formed an Advisory Committee in Advanced Television Service (ACATS) in 1987, with a mandate to study and test proposed systems for the terrestrial broadcast of Advanced Television, and to make recommendations for the selection of a standard.

Under the chairmanship of Richard Wiley, a past Chairman of the FCC, ACATS has made much progress in the last three years. In 1988 the FCC

tentatively decided that HDTV service should be integrated with and be compatible with the existing NTSC service and its tradition of localism and diversity. Further, the FCC found that HDTV service should not impair or restrict current NTSC broadcast service.

In 1989, Alfred Sikes became Chairman of the FCC, and under his leadership, the FCC announced that a terrestrial transmission standard would be chosen by the middle of 1993.

Secondly, Chairman Sikes determined that priority should be given to the selection of a simulcast system in which TV stations would broadcast both a NTSC and a HDTV signal.

Further, Chairman Sikes has emphasized that the public interest is best served by the adoption of a technically excellent standard.

The ACATS work continues, with three subcommittees, 13 working parties and numerous Specialist Groups, together involving some 450 experts in many fields. Three interim reports have been presented to the FCC.

In 1988, CBS defined requirements of a HDTV terrestrial broadcast system:

(i) Existing NTSC service should continue unimpaired during the transition period.

(ii) The broadcast system should be competitive in quality with that provided by other non broadcast distribution media.

(iii) The system should provide technical headroom for future improvements in order to retain competitive parity.

(iv) The propagation system should be spectrum efficient.

(v) The transmission system format should be capable of interfacing with other distribution media.

In addition to detailed spectrum studies and the test and evaluation of proposed systems, ACATS is developing assessments of the cost of converting local TV stations for HDTV terrestrial broadcast. This work is being performed by the System Subcommittee's Working Party 3.

CBS is contributing to this effort with an ongoing study of the costs of implementing HD terrestrial broadcast service, and this interim report details the results to date.

While recognizing that ATV service using improved and extended definition TV technology may prove attractive from the broadcasters' point of view, this study is concerned only with full HDTV service. This is in accord with present FCC policy, which is to first assess a high definition --and not an extended definition, or EDTV--transmission standard.

Following Chairman Sike's policy directive, this report considers only HDTV simulcast systems. A simulcast system is one in which the existing NTSC broadcast channel remains unimpaired (an FCC requirement), and a second 6 MHz channel is allocated for the transmission of HDTV programs. Thus, a television station may transmit a program in HDTV and NTSC simultaneously.

The simulcast approach will permit system designers the opportunity to seek the best possible system for terrestrial broadcast, and will allow stations to start HD service only when it is economically advantageous for them to do so.

This report thus represents a work-in-progress, and invites a dialogue on the complex issues confronting the industry on the timing, phasing, and the cost of the transition to HD.

The CBS study is continuing, and is supported by important contributions from CBS affiliate stations, who are providing data on their past, current, and projected capital investments, and on the feasibility of adding a HD transmitting antenna to their towers.

2. PREMISES AND ASSUMPTIONS

A number of important working premises and financial assumptions have been made in developing transition scenarios. These are outlined in Figure 1, listed below, and discussed in more detail later.

(i) Stations in the larger markets will be the first to make - the transition to HD, not unlike the introduction of color television.

(ii) The transition will be conducted in phases, with each phase adding to the HD service provided by a station. Stations in larger markets will complete the transition in a shorter time than smaller market stations who may thus spread the capital investment program over a longer period. This again is similar to the introduction of

(iii) The labor cost of transition is 20% of the investment in capital equipment.

(iv) The transmission system selected will be all-digital and thus will require a much lower Effective Radiated Power (ERP) than current NTSC systems to reach the same audience. With a resulting, relatively small, HD transmitting antenna, the existing tower can be used.

(v) The initial prices for equipment are based on developmental and prototype units. For the period considered, with each doubling of the number of units manufactured, the cost will fall by 10% of the prior cost.

(vi) Existing plant, studio, and control room audio equipment will be reused, not replaced. It is further assumed that a station has previously converted to stereo.

SIMULCAST HDTV TRANSITION SCENARIO ASSUMPTIONS

- LARGER MARKET STATIONS WILL CONVERT FIRST
- TRANSITION IN PHASES, SPREAD OVER 5-9 YEARS
- LABOR TO INSTALL THE CAPITAL EQUIPMENT: 20% OF CAPITAL EQUIPMENT COST
- TRANSMISSION FORMAT WILL HAVE LOWER ERP THAN NTSC - SMALLER ANTENNA PERMITS INSTALLATION ON PRESENT TOWER
- EACH DOUBLING OF HD EQUIPMENT MANUFACTURED WILL LEAD TO 10% REDUCTION IN PRIOR COST
- EXISTING AUDIO EQUIPMENT WILL BE REUSED, NOT REPLACED

FIGURE 1

3. PHASED IMPLEMENTATION

The introduction of a HDTV transmission service at a TV station will be a gradual process and will be implemented in phases. Each phase provides an incremental capability, and builds upon the preceding phases. (Figure 2). The number of phases, and the nature of the capability added in each phase, may vary from market-to-market or from station-to-station. Here is one, six-phase scenario:

Phase A: Network Pass-through

This is the minimum conversion necessary to deliver network supplied HDTV programming to a market. An additional transmitter and antenna will need to be purchased and installed, together with an additional studio-transmitter link, using microwave or fiber optics. Additional satellite earth station equipment for the reception of network programs, and some distribution, test, and monitoring equipment will be required. The only local origination is the insertion of station identification announcements.

Phase B: Local Commercials

In phase B, additional equipment will be added by the station to allow for local commercial inserts within the network programs.

Phase C: Local Videotape Programming

Video tape equipment will next be added to allow for playback of non-network (syndicated) programming when the network is not supplying HDTV programs.

SIMULCAST HDTV SCENARIO
PHASES OF TRANSITION

PHASE

A - PASS-THROUGH OF NETWORK HD PROGRAMS

B - INSERTION OF LOCAL COMMERCIAL MESSAGES

C - PLAYBACK OF NON-NETWORK SYNDICATED HD PROGRAMS

D - LOCAL ORIGINATION OF HD PROGRAMS

E - COMPLETE PLANT CONVERSION TO HD

F - LOCAL NEWSGATHERING (ENG) IN HD

FIGURE 2

Phase D: Local Studio Origination

A local station in this phase becomes an HDTV production facility. Phase D will add equipment to allow local production to be staged, recorded, edited, and broadcast.

Phase E: Final Plant Conversion

The entire plant systems are next upgraded, giving the station full HDTV capability. All production and origination, except for news gathering, is in HDTV. At this stage when the network transmits a program only in HDTV, the local station will down-convert the signal for the NTSC simulcast.

Phase F: Electronic News Gathering

This phase requires the conversion of the Electronic News Gathering (ENG) equipment to HDTV. At this point all local production is effected in HDTV, and the HDTV signal will be down-converted for NTSC simulcast.

4. TRANSITION SCENARIO

The six phases of conversion identified above are designed to provide an incremental capability with the completion of each phase. The block diagram in Figure 3 presents the completely converted station, with each phase outlined.

Phase A: - Network Pass-through

Shows the acquisition of an earth station receiving a satellite signal. The signal is decoded and routed to a switcher.

HD STATION CONVERSION BLOCK DIAGRAM

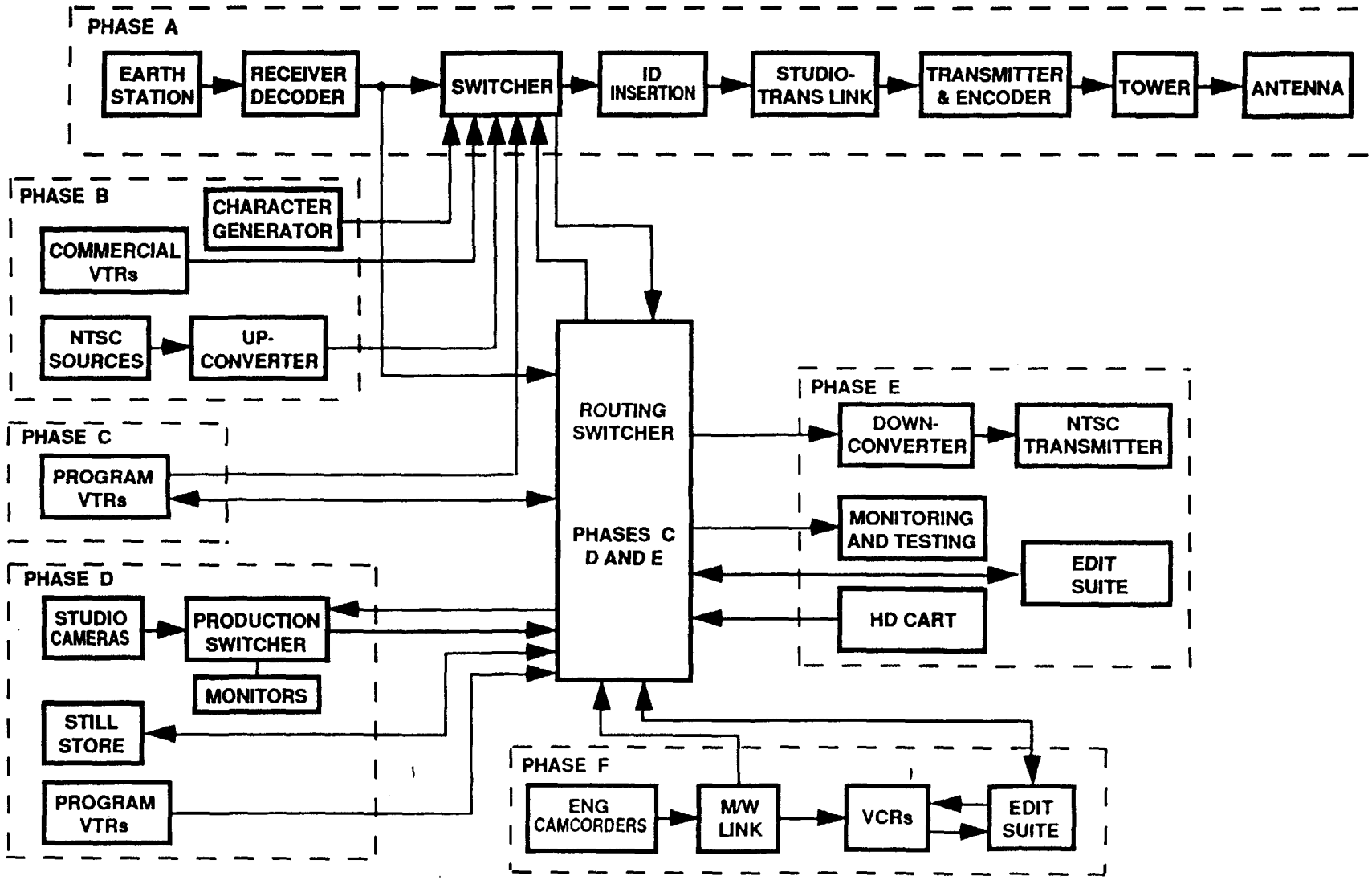

FIGURE 3